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ENORMOUS TUMOR OF THE POSTERO-PARIETAL REGION, WEIGHING OVER HALF A POUND; ABSENCE OF LOCALIZING SYMPTOMS UNTIL LATE IN THE HISTORY OF THE CASE; OPERATION; DEATH.

History of the case by Dr. Dercum.

By F. X. Dercum, M.D., and W. W. Keen, M.D.

The following case, because of the extreme difficulty of localizing the growth, of the nature of some of the symptoms present, and because of the enormous size of the tumor, is of unusual interest and importance.

H. W., age twenty-six, single, formerly civil engineer, later hotel proprietor. Examined April 23, 1902.

Family History. Mother died at the age of thirty-six with pulmonary tuberculosis. Father living and in good health. Patient has one sister, who is also living and well.

Personal History. Was healthy at birth. At the age of one year, suffered from a discharge from the right ear and subsequently lost his hearing upon this side to a very decided degree. An examination made some years later revealed a perforation of the drum. At long intervals, discharge from this ear recurred. During the past year or two the ear has again been a source of annoyance, as it has again been discharging a thick offensive fluid.

The patient had the ordinary diseases of childhood, from which he made good recoveries. He has had, since childhood, no serious illness, that is nothing that confined him to bed. He had at various times occasion to consult physicians for indi-

gestion and occasional attacks of headache. He had been educated as a civil engineer, and some years ago, while working in some mines in Kentucky, had received at various times quite severe blows on the top of his head, but not severe enough to cause loss of consciousness. At another time his legs were seriously bruised by an accident.

For a year past he has been manager of a hotel at a seaside resort, and in March, 1902, his hotel was suddenly placed in danger from fire. At this time he exerted himself very greatly in order to secure the safe exit from the hotel of his guests and other persons, and also to save their trunks and valuables. Although he had been placed under sudden and serious strain, he betrayed no special symptoms save some headache. This headache persisted, and he believed that it was in some way connected with his eyes. He thereupon consulted Dr. G. E. de Schweinitz. Dr. de Schweinitz reports that he found at this time no changes whatever in the eye-ground, nor any defect of any of the ocular muscles. About one month later, on April 23, the patient again visited Dr. de Schweinitz, and upon this second examination a double optic neuritis was observed. It was most marked in the left eye, the field of which was somewhat contracted. There was also paralysis of the right external rectus and a consequent diplopia.

On April 23 he was first examined by myself. Questioned again as to his past history, he now recalled that for a number of months past he had noticed a little uncertainty of movement in the right arm, that he noticed occasionally that he would make a mistake in the act of picking up his pen, that is, that his fingers would not grasp the pen but would go a little to either side of it. He distinctly recalled that upon one occasion when about to help himself to butter he put his fingers instead of his knife into the butter. These acts of slight loss of control of the movements of the right arm were not, however, frequent. He also noticed awkwardness of movement in his legs, in trying to go upstairs two steps at a time. He added also that he had recently had several attacks of vomiting, especially in the early morning, before he had taken any food.

Present Condition. Complains of a dull headache. Asked to localize it, he states that it is more marked over the left eye. At times the headache is diffuse over the entire forehead. He has no headache over the parietal region, over the vertex or over the occiput. At times he has a feeling of tension about the head and at times also he is dizzy. Occasionally, if he stoops to pick up something from the floor, he is obliged to get up slowly; otherwise the pain in his head grows worse. Has no ringing in

the ears. Has not vomited for several weeks past, but not infrequently feels inclined to vomit.

Physical Examination. Gait normal. Station normal. States, however, that he has a feeling of uncertainty while making the Romberg test. Stands fairly well upon either leg alone. There is no intention tremor. Tongue protruded in the median line. The tongue is slightly tremulous. There is also a little tremor and unsteadiness of the lips. The left eyelid droops slightly. The right nasolabial fold is possibly a little shallower than the left. There is no inequality of the mouth. There is marked deafness of the right ear, which is due evidently to an old otitis media. The grip of the right hand is 84; the grip of the left hand is 74. There is no change in the handwriting, though the patient himself declares that it is somewhat shaky. There is no ataxia. Both knee-jerks are minus, but are well reinforced. There is no ankle clonus. The Achilles jerk is present and apparenty normal. There is no Babinski sign. There are no sensory losses, though the patient complains of a feeling of numbness upon the inner aspect of the lower portion of the right thigh and upon the inner aspect of the right calf. There is loss of stereognostic perception.

His pulse is 70 and his temperature is 98.2.

Urine Report. Amber; specific gravity, 1,025; reaction acid; no albumin; no sugar; urea, 1.6 per cent.

Microscopic Report. Negative.

Blood Report. Erythrocytes, 4,650,000; leucocytes, 10,200; hemoglobin, 70 per cent.

Because of the history of long-standing disease of the right ear, and because of a possible brain abscess, it was thought wise to subject the ear to thorough surgical exploration. Dr. Charles K. Mills, who saw the case in consultation at this time, fully agreed with me as to the advisability of this procedure.

Dr. de Schweinitz now made another eye examination, and reported as follows:

Mr. W. has a paresis of the right external rectus. He has double optic neuritis with many hemorrhages of the succulent and inflammatory type. Beyond this the examination revealed nothing new.

On May 12, 1902, the patient was operated upon by Dr. J. Chalmers da Costa.

A two-inch semilunar incision was made over the right mastoid, all structures being divided to the bone. The cartilaginous aural canal was then separated from the bony wall, and the mastoid chiseled. This was found decidely hard and completely ossified; the opening was enlarged with rongeurs, and the middle and posterior fossæ of skull were exposed and explored. The dura

and brain tissue were found apparently normal, and hence the dura was not opened; the parts were thoroughly cleaned, hemorrhage controlled by torsion and ligature. A small strand of iodoform gauze was inserted, the aponeurosis was closed with catgut and the skin with silkworm gut. The drainage was removed at the expiration of forty-eight hours.

The patient made an uneventful recovery from the operation, and for a time was better, being free from headache, vertigo or vomiting. On May 20, however, in the morning, he complained of some vertigo and nausea. About noon had his wound dressed; suffered from nausea. Induced vomiting by means of his finger. Felt some relief after this vomiting, though the nausea persisted more or less for the remainder of the day. In the evening complained of a slight headache.

On May 25, 1902, he was re-examined by Dr. Mills and myself.

Station. A slight increase of sway.

Right knee-jerk slightly diminished; left knee-jerk slightly diminished.

Right ankle clonus slight disappearing; left ankle clonus, zero.

Right plantar reflex, zero; left plantar reflex, normal.

Faint hypesthesia of the inner aspect of lower portion of right thigh and right leg.

June 1, 1902. Symptoms as before. Tested for astereognosis upon the soles of the feet, it was found that he was somewhat uncertain as to the position of a pencil when the latter was placed in various positions upon the sole of the right foot. In one instance he clearly mistook the direction for transverse when it was longitudinal. Upon the sole of the left foot he made no errors whatever. Further, he did not recognize little balls of paper placed between the toes of the right foot as readily as when they were placed between the toes of the left foot.

June 3, 1902. Re-examination by Dr. Mills and myself.

Right knee-jerk, minus; left knee-jerk, minus.

Right ankle clonus, slight disappearing; left ankle clonus, zero.

Right plantar reflex, sometimes absence of response; left plantar reflex, normal. Other symptoms as before.

June 7, 1902. This evening (about 7.30) complained of nausea and vertigo. This attack appeared rather suddenly and was quickly followed by an attack of vomiting. Vomiting was not followed by any relief, though it recurred at intervals; it was accompanied by considerable retching. The vomited material consisted of a thick viscid mucus and some bile. Nausea and vertigo had almost disappeared by the following morning, after patient had slept fairly well.

June 10, 1902. Examined by Dr. W. G. Spiller. Present, Dr. Mills and myself.

Left knee-jerk, minus; right knee-jerk, more diminished.

Sensation for touch preserved in each lower limb and appears to be equal upon the two sides. The same is true of pain sensation. If hypesthesia is present upon the right side, it is exceedingly slight.

Movement of the toes to irritation of the sole of the right foot is that of flexion of all the toes, except the great toe; the great toe does not move. Upon the left side the movement is that of flexion, including that of the great toe. The only difference between the two sides is that the great toe of the right side does not move at all.

Left ankle clonus, zero; right ankle clonus, zero.

The Achilles jerk is prompt upon the left side, while upon the right side, tapping the tendo-Achillis causes repeated contractions, like ankle clonus.

Patellar clonus is not present upon either side.

Resistance to passive movements seems to be fully normal in each limb.

He stands erect without swaying, even when eyes are closed.

The gait is not peculiar.

Hemiasynergy is not present in either lower limb when the patient is reclining.

The grasp of each hand is good and apparently normal.

The biceps jerk, triceps jerk and wrist reflexes are not very distinct upon either side.

Sensation to touch and pain in the upper limbs is equal upon the two sides, and is normal. States that his right hand is numb, that this is so distinct that he is certain it exists and yet upon testing it cannot be determined.

The patient states that since the operation, or possibly before the operation, he has been a little weak in the right lower limb, and also in the fingers of the right hand, arm and right leg; he complains of being awkward with the right hand. There is apparently some disturbance of sense of position. On attempting to put the first finger of the right hand on the first finger of the left hand, or vice versa, when eyes are closed, he has much difficulty in touching the desired objects. He is able to tell correctly any movement of his fingers or toes when his eyes are closed. Stereognostic perception is normal in both upper limbs.

Hemianopsia is not present. The pupils are equal. There is no nystagmus in looking to either side. Movement of the facial muscles is normal upon either side. Movements of the muscles of mastication are normal upon either side. There is no word-deaf-

ness, no word-blindness, and no symptom of sensory or motor aphasia. His memory is not quite as good as formerly. Says that he has become more irritable than formerly. Also that within the last twelve months he is not as good at figures as formerly; he cannot add or multiply as well as formerly, and this change he regards as very perceptible, and is even greater than the failing of memory. He has more difficulty than he formerly had in understanding the meaning of what he reads.

The patient is not as able to tell whether a pencil is placed lengthwise or crosswise upon the sole of his right foot; he makes no error upon the sole of the left foot.

June 20, 1902. Re-examined by Dr. Mills, Dr. Spiller and myself.

Lower limbs are well developed, although he says he is not as stout as a few years years ago, weighing about twenty pounds less at the present time.

Resistance to passive movements of the thigh and leg, of each side, is normal and equal on the two sides.

Sensation to touch and pain in the lower limbs normal, though possibly tactile sensation is slightly diminished in the right lower limb as compared with the left. This diminution, if present, is slight. There is a slight diminution in the right lower limb to pain, tactile and temperature senses.

The patellar reflex on the right side is possibly slightly diminished; on the left side a little more pronounced than on the right side. Ankle clonus not obtained on either side. Plantar irritation upon the right side produces a slight movement of all toes in flexion, except the great toe, this not being moved at all; movement of the other toes is slight. On the left side, the movement of all the toes is that of flexion.

The Achilles jerk is present on each side and is about normal.

The gastrocnemius reflex is present on each side. These reflexes, Achilles and gastrocnemius, being equal on both sides.

Station erect is good with eyes closed. Gait normal. Stands well on each foot alone. Resistance to passive movement in the right upper limb is normal; the same in the left upper limb.

Sensation to touch, pain and temperature is normal in the two upper limbs. There is possibly a slight diminution in the right arm, but this is questionable.

Biceps jerk, triceps jerk and wrist reflexes are about normal upon the two sides. The sense of the position of the fingers and toes of each side seems to be normal, but he is not always certain of the right great toe. He seems to be able to tell correctly movements of the left great toe. Apparently there is no loss of the sense of position in the upper limbs, or at least the loss is not

pronounced. The movement of the right upper limb, when the eyes are closed, would suggest a slight loss of the sense of position.

The stereognostic sense is well preserved in both hands, although he occasionally makes a mistake in trying to differentiate between a dime and a cent with the right hand. These mistakes are infrequent. He never, however, makes any mistake with the left hand. Upon the sole of the right foot, there is again noted, as at previous examination, a tendency to make errors as to the position of the pencil or penknife when placed upon the sole of the right foot. Upon the sole of the left foot no errors are made at any time.

The patient was re-examined July 5 and July 29 and presented no noticeable change of symptoms. On September 5, 1902, he was re-examined by me. His symptoms were the same as at previous examinations, save that there was present an area of undoubted tenderness over the skull in the left post-parietal region. This area in front begins at eight and a quarter inches from the glabella and about half an inch from the sagittal suture. It extends as far back as to within one and three-quarter inches of the occipital protuberance. It is about two and three-quarter inches in its longitudinal diameter. It extends downward over the parietal region for about two inches. It appears to be oval in shape. The patch is sensitive upon superficial pressure and made worse upon deep pressure, and pain is also readily elicited by friction. The patient states that this area has been more or less noticeable since August 31.

Of late the patient has suffered but little from headache, having had but one severe attack since he was last examined. His diplopia is about the same. Dr. de Schweinitz reports his vision as perhaps slightly better. There is little or no change in the paresis of the left external rectus. There is less swelling of the optic discs than there was.

Because of the new symptom of tenderness in the post-parietal region, I submitted the patient to another examination on September 11, at which Drs. Mills and Spiller were also present. Strange to say this symptom of tenderness had at this examination almost or completely disappeared, so that it could not be confirmed by either of my colleagues. Otherwise the symptoms were as noted at previous examinations. It was thought by Drs. Mills and Spiller that possibly there was a slight awkwardness in the movement of the fingers of the right hand and of the toes of the right foot. Difference in the movement between the digits of the two sides of the body, however, was so slight as to be open to discussion. This remarkable symp-

tom of tenderness, both superficial and deep, upon the post-parietal region never subsequently recurred, although new symptoms made their appearance, while some of the old ones gradually became more pronounced.

On October 17, 1902, he again presented himself for an examination, and it was now found that in addition to the symptoms which he had presented before, there was a slight hypesthesia of the left side of the face. It was most marked over the middle distribution of the trigeminal and to a less extent externally over the superior. Mr. W. was able to detect all tactile impressions directly, but hypesthesia was undeniably present. He also described a subjective sensation of numbness and a crawling sensation in the left side of the face; also that the left side of the face felt somewhat stiff. The slight difference in the nasolabial folds, noticed in the early history of his case, was still present, but had not become accentuated. There was no involvement of the muscles of mastication. The patient had had very little headache, and only a slight attack of nausea some two weeks ago. About this time his case was studied by Dr. William Osler, who, with myself, thought that this numbness of the face suggested a deep basic lesion upon the left side. Dr. William M. Sweet now made several careful skiagraphs of the head, but no shadows were revealed that seemed in any way to suggest the location of a tumor. After a consultation with Drs. Mills and Spiller, it was determined to advise an exploratory operation of the base upon the left side. The patient's symptoms were at this time gradually becoming more pronounced, although the general symptoms were as before. The optic neuritis was now of high grade, with beginning degeneration of the optic nerve fibers, with resulting depreciation of vision (de Schweinitz). The fields were contracted, but there was no hemianopsia, the pupillary reactions were unchanged. There was a palsy of the right external rectus, thirty degrees, and a palsy of the right superior rectus (possibly inferior oblique) of eleven degrees. There was some widening of the palpebral fissures, giving the appearance seen in hydrocephalus.

On November 3, 1902, Dr. Keen made an osteoplastic flap in the left temporal region, but beyond determining a distinct resistance posteriorly, the operation resulted negatively as regards localization of the growth. Mr. W. made a perfect recovery from the operation and subsequently returned to his home. He was not seen again until December 17, 1902, when it was found that the hypesthesia of the left side of the face had disappeared. There was, however, a slight, but unmistakable hypesthesia present in the lower limb and to a less extent of the right upper

limb. The plantar reflex was not obtainable upon either side. The knee-jerks presented the same difference as at previous examinations, as did also the ankle clonus. The grip of the right hand was 65; that of the left hand, 60. The patient stood well upon either leg alone. The tongue was protruded in the median line. There was no facial inequality. The atrophic changes in the optic nerve were somewhat more marked than at the previous examination. When tested for astereognosis, occasionally made errors with the right hand. No word-blindness. No word-deafness.

The patient now passed from under my observation. I did not again see him until March 18, 1903. Dr. T. Percival Gerson, of Lansdowne, under whose care he was, reported that he had gradually become hemiplegic, there being a very gradual loss of power making its appearance in the right side of the body, right leg and right arm, also that there had been very decided loss of sensation upon the right side and awkwardness of movement.

March 18, 1903. Examination by Dr. Dercum, together with Dr. Gerson.

Mr. W. presented the following symptoms: He entered the room with a decided hemiplegic gait, dragging the right leg and allowing the right arm to hang at his side. He was not able to stand upon the right leg alone, while the loss of power in the right arm was also very marked. There was a decided hypesthesia of the right arm, right leg, right side of the face and head and right half of the trunk. This hypesthesia was not sharply demarcated by the middle line. It was most marked in the distal portions of the extremities and became less marked as the middle line of the trunk was reached. The area of but slightly impaired sensation extended from two to four inches from the middle line to the right. The right knee-jerk was much exaggerated. The left knee-jerk was about normal. There was now persistent ankle clonus upon the right side. The elbow jerk was present upon the right side, but not pronounced. There was a slight von Bechterew reflex upon the right side.

The Babinski reflex was not present upon either side. Upon the left side the toes moved normally, but on the right side there was a slight movement of the four outer toes in flexion, while the great toe did not move at all. Right-sided homonymous hemianopsia was now present, although both visual fields were distinctly contracted. This hemianopsia could readily be demonstrated and was quite well defined by the middle line. Wernicke's symptom was not present. Astereognosis was now complete. There was also typical word-blindness. There was no word-deafness. The patient had, however, a distinct difficulty in the use of substantives. He was unable frequently to give the name of

common objects, such as a book, even though he examined the book both by vision and touch. The symptom of anomia was not complete, but it was undoubtedly present. At this examination, tenderness in the post-parietal region was again sought for, but not elicited.

Because of the new features presented by the case, I decided to again advise an operation, and submitted the question to my colleagues, Drs. Mills and Spiller, who concurred in its advisability. Accordingly, on March 26, he was operated upon by Dr. Keen, who made a large exposure of the parietal region. The details of the operation are given by himself. The bone proved to be excessively vascular, and the operation had to be completed in three stages, the final result being the removal of an enormous sarcoma, weighing 264 grams. The mass was encapsulated and was removed without much difficulty, but the patient succumbed to shock and operation shortly afterward.

Although no autopsy was obtained, the fact that the tumor was encapsulated makes it exceedingly probable that only one sarcomatous mass was present in the brain, and that all of the symptoms were referable to this growth. The interest of this case lies in the extreme difficulty of the localization and in the indefinite and often misleading character of the symptoms. It is remarkable that cortical disturbances, such as unmistakable astereognosis and alexia on the one hand and hemianopsia upon the other, were not present earlier in a case of tumor in this situation. The inference is justified that the growth originated subcortically and only late in the course of the affection produced cortical phenomena by upward growth and hemianopsia and basal phenomena by downward growth. In reviewing the symptoms we are impressed by the fact of the insignificant value of such a sign as a paralysis of one abducens or of a trifacial hypesthesia. In the present instance they were undoubtedly due to pressure from a distance, and as is well known, they frequently so occur from such cause. They are of themselves of little or no localizing value. However, the case does demonstrate the localizing value of astereognosis and slight muscular incoordination. In reviewing the history of the case, it will be noted that faint, but unmistakable astereognostic signs were present upon the sole of the right foot, and somewhat later upon the right hand, as were also faint, though somewhat inconstant

symptoms of incoordination of the right fingers and right toes. Lastly, the symptom of local tenderness and pain in the post-parietal region, which was present for a few days only, assumes a vast importance. It was so fugitive that it was not present at the examination made a week later by Drs. Mills and Spiller, and was apparently absent at the examination made by Dr. Osler, and yet that there was abundant cause for such a pain, the finding at the operation of a large exostosis of the internal table in this very situation most conclusively proves.

To repeat, the history of the case and the very gradual evolution of localizing phenomena justify the inference that the tumor began subcortically in the post-parietal region, and that it grew downward and upward very gradually. It would seem to me that it would be a perfectly justifiable expedient and far preferable to what was done by ourselves in this case, when symptoms of one-sided trouble, vague in character, make their appearance, not to attempt an exploration of the base, which is always a matter of extreme difficulty, but to make a free osteoplastic exposure of the most probable area upon the lateral aspect. The free osteoplastic exposure is attended with little risk, and the exploration possible under the circumstances is, as a rule, very thorough. Had such a plan been attempted by us I am quite sure that the tumor would have been found, though early in the case it would doubtless have been found to be situated beneath the cortex. The lesson to be drawn from this case is to make free osteoplastic exposures in all cases yielding symptoms referable to one side of the cortex, no matter how slight these symptoms may appear to be.

The tumor apparently grew very rapidly in the last few months of the patient's life. The size and weight that it attained were truly enormous, and showed how very much pressure the brain can withstand without destroying the life of the patient.

Surgical Report by Dr. W. W. Keen.

I first saw Mr. White in consultation with Dr. Dercum on October 29, 1902. The reasons for operating at the point selected, and also for the site of the prior operation which Dr. DaCosta made on the right side in the spring of 1902, have already been given by Dr. Dercum.

Operation November 3, 1902. I made a flap in the left temporal region (Fig. 1) practically the same as that for the Gasserian ganglion, including chiseling the zygoma so as to get down as low as possible. First, with a gouge I made a small opening in the bone, and then with the rongeur forceps enlarged it till it was 4 to 5 cm. in diameter. The bone seemed to be unusually thick, two or three times the ordinary thickness in this position. Exposure of the dura showed that it was very resistant and bulged considerably. As soon as it was opened the brain protruded. I attempted to lift the temporo-sphenoidal lobe with a broad spatula, so as to gain access to the pons, where the tumor, it was thought, might possibly be. It was, however, evident that the protrusion of the brain was such that I should do very extensive damage to the brain tissue if I lifted it to the desired extent. The cortex did not seem harder than usual, though the sense of resistance in the brain as a whole was quite marked.

In order to determine whether there was any possible distension by fluid, I punctured the lateral ventricle, but did not find any. The diminution of resistance when the ventricle was entered was very perceptible. I then incised the temporo-sphenoidal lobe to a depth of 3.5 cm. and introduced my finger into the incision. The white substance was normal to the eye. To the finger there was a distinct increase of resistance to pressure *posteriorly* as compared with the other three directions. After making several attempts to lift the temporo-sphenoidal lobe, and failing to see even as far as the site of the Gasserian ganglion, I abandoned the operation. He made a perfectly smooth recovery, the highest temperature being 99.6 degrees.

Second operation, March 26, 1903. First Stage. Owing to the development of new symptoms, especially hemianopsia, after a consultation with Drs. Dercum, Mills and Spiller, we decided that it would be wise to do a second operation. The site of the tumor was now more accurately located in the parietal lobe extending forward perhaps as far as the fissure of Rolando and well backward into the occipital lobe. It will be observed that when at the first operation I introduced my finger into the substance of the temporo-sphenoidal lobe, I recorded at that time that the resistance posteriorly was distinctly greater than in the other three directions. This also would confirm this diagnosis as to the situation of the tumor.

I outlined a flap, the anterior border of which crossed the fissure of Rolando about at its middle, and passed nearly vertically upward, 9 cm. long (Fig. 1). Parallel with the median line, but 2.5 cm. away from it, I made an incision 13 cm. long; this reached into the occipital lobe. The posterior incision was

12 cm. long, as indicated in the diagram. The hemorrhage from the scalp was exceedingly profuse. At every point where the bone was exposed sufficiently to chisel it, wherever a little vessel penetrated the skull, the blood poured out from the bone in a fountain nearly 1 cm. in height. These were stopped by Horsley's wax, the vessels in the scalp being clamped. I then proceeded to chisel the bone. Of course the incision was not all made at first, but in three sections, and the chiseling of one was completed before the next was begun. The bone also I found very vascular. Some of the veins of the diploë poured out distinct streams of blood. These also were stopped by Horsley's

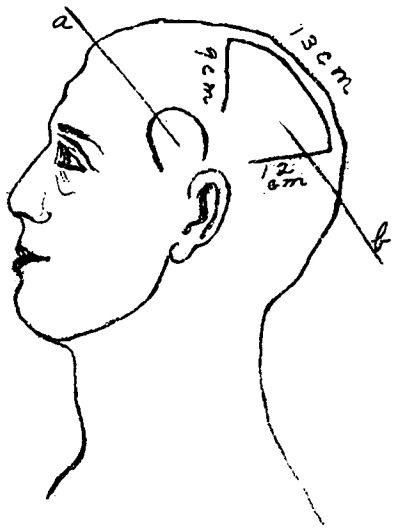

Fig. 1.

wax, but in spite of this a large amount of blood was lost. I could not understand why, especially at the posterior portion of the median incision, I did not get through the bone. While I was operating, one of my assistants, Dr. Craig, opened a vein in the right arm and infused 20 ounces of salt solution, to which were added 20 drops of 1-1000 adrenalin solution. Finally, as the patient had lost so much blood, we decided that the vascularity of the parts showed that the tumor lay underneath the proposed flap, that it was a very vascular sarcoma, and that if I continued the operation there would be so large a loss of blood

when I turned back the osteoplastic flap that it would probably cost him his life. I decided, therefore, to do the operation in two stages.

After the operation his temperature, up to the 29th, rose to a little above 100°, but from the 29th to the 31st fluctuated between 101° and 102.6°. In spite of the high temperature, he did not seem to be very sick, though his pulse was from 100 to 120.

Second stage. On March 31 we decided to reopen the skull and operate on the tumor. As I anticipated, a very severe hemorrhage from the tumor, I first clamped the common carotid with Crile's clamp and obliterated the caliber of the artery. After reopening the wound in the scalp, which was attended with very free bleeding again, I chiseled some places in the bone where I had not chiseled entirely through, especially in the portion parallel with the median line just posterior to its middle, and at last was able to turn back the flap. As soon as it was reflected, the difficulty of chiseling through the bone was explained. On the inner surface, just at the median edge of the flap and 3 cm. from its posterior end was a bony tumor, conical in shape, 2.5 cm. in height and 2.5 cm. in diameter. The chisel had traversed this bony tumor, where the bone was about two to three times its ordinary thickness. With the rongeur forceps I removed the entire bony growth. The dura was very soft, and at one point there was a deep depression corresponding to the bony growth. The tumor was evidently partly cystic. I then opened the dura corresponding to the osteoplastic flap. A considerable amount, estimated to be seven and one-half ounces, of bloody serum, so bloody that at first I thought it to be pure blood, escaped. This led me to ligate the common carotid and remove the clamp.

As soon as the brain was exposed, the entire opening in the bone, large as it was, was filled with a very large bulging sarcoma. It was so large and his condition was so critical, in spite of another infusion of a pint and a half of salt solution with 30 drops of adrenalin 1:1000 solution, that my judgment was against any attempt to remove the entire tumor, but I scooped out with my fingers a large handful. The hemorrhage was free, but not alarming. Packing with iodoform gauze, douching with hot salt solution checked the bleeding, and I closed the wound after gnawing away a part of the edge of the bony flap in order to allow the end of the gauze packing to protrude. I also ordered five minim doses of the adrenalin every four hours hypodermatically.

On the day after this operation his temperature rose to 103.2° and continued between 100° and 102° for nine days. It then fluctuated between the normal and 100°; meantime the wound

had healed without incident. The packing was removed on the second day without any noticeable hemorrhage; the wound in the neck healed by first intention.

On April 1, the day after the operation, he moved his right arm once, but then was completely paralyzed on the right side for a week. Movement then began both in the right arm and leg, and he gained so rapidly that, after sitting up in bed for two or three days, I got him out on a chair, and on the seventeenth day he was able to walk down stairs into the garden of the hospital.

As his parents and he himself, appreciated the fact that if the tumor were not removed the end would be fatal, they consented to another and final attempt to remove the remainder of the growth. In view of his very good condition, Drs. Dercum, Mills, Spiller and myself, after a conference, determined upon the final attempt.

Third stage, April 21st. The flap was reopened very readily, the adhesions giving way under moderate leverage. The same peculiarity noticed before, was again evident, viz,—abundant hemorrhage not only from the scalp, but that every vessel which penetrated the bone became a little fountain. Again Horsley's putty stopped this quite effectually. After gnawing away the bone sufficiently and removing the diseased portion of the dura, I was able to reach the limits of the tumor. The tumor extended 2 cm. in front of the anterior border of my original opening in the bone, 1 cm. inferiorly and 1 cm. posteriorly. It extended in the middle line entirely to the falx. This large mass, which more than filled my entire hand, I was able to enucleate quite easily and cleanly. Fully one-half of the entire area of the falx was exposed as soon as the tumor was removed. The hemorrhage, especially from the middle and posterior portions of the wound was very profuse. Packing with iodoform gauze arrested it in part. Adrenalin was given together with a saline infusion continuously until 30 drops of 1:1000 solution of adrenalin and a pint and a half of salt solution had been administered. No distinctly large vessels, which could be ligated were discoverable. Accordingly I had to trust entirely to packing and hot water. The flow was so profuse that adrenalin locally would have done no good. The wound was packed as firmly as was deemed advisable, the wound closed and the patient put to bed. He was in very profound shock and died about half an hour after being placed in bed. A culture from the surface of the tumor was given to Professor Coplin, who reported that the micrococcus pyogenes albus in pure culture was found. No abscess

existed but the surface of the tumor was softened over a small area.

REMARKS.

Weight. This tumor is the largest that I have ever removed from the brain. I have not compared it with any accurate list to see what others have exceeded it in weight, but so far as I know the only one which exceeds it, is that removed, with better success, I am glad to say, by Bramann.[2] His tumor weighed 280 grms., 16 grms. more than this.[3] The tumor here reported weighed 264 grms., more than half a pound.

Hemorrhage. In few, if any, cases have I seen more severe hemorrhage from both scalp and bone. This seemed to indicate that the tumor lay directly under the site of the final operations. In the bone, Horsley's wax answered admirably in arresting the bleeding. At the final operation the hemorrhage from the brain was so great that even quite firm gauze packing did but little good. No known large sinus, vein, or artery was opened, but the hemorrhage was universal and severe. The application of Crile's clamp and finally ligation of the common carotid on that side modified it but little.

Exposure of the Falx Cerebri. Only very rarely have I removed a tumor which exposed the falx. In this case the exposure covered at least one-half of the superficial area of the falx, though less than one-half of its length.

Dr. Spiller examined the tumor and made the following report:

"At the earlier operation by Dr. Keen, a large portion of the tumor was removed. The mass removed was easily broken, and had in the fresh state the appearance of a sarcoma. The portion removed was hardened partly in formaline and partly in Müller's fluid. After hardening had occurred the portion in formaline weighed 27 grms., that in Müller's fluid 49 grms. The part first removed has an irregular surface as though it had been torn away from a tumor mass.

"The part of the tumor removed at the later operation is much larger than that removed at the earlier operation, and two-thirds of its surface are sharply defined and nodular, as though it had been sharply separated in this portion from the surrounding brain tissue. Approximately one-third of the entire tumor, if one may judge from the form of this large tumor, must have been removed at the earlier operation. One side of the large tumor has a torn appearance, and from here probably the first piece of tumor was removed. The upper surface of the tumor is flat. The

weight of the second portion removed, before any hardening fluid had been used, was 188 grms., so that the entire weight of the tumor, including hardened and unhardened tissue, was 264 grms.

"The tumor consists of small spindle-shaped cells without definite arrangement, and is not exceedingly vascular. It is a small spindle-cell sarcoma."